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(54) **DEVICE FOR GAS ANALYSIS USING RAMAN SPECTROSCOPY**

(57) Device (12) for analyzing the gas composition, of an optical type, characterized in that it comprises:

- an exciting radiation emitter (14) comprising a multi-mode laser source (16) configured to emit a laser beam;
 - an analysis cell (18) suitable for containing a gas, said analysis cell (18) having an inlet duct (20), through which a gas can flow inside said analysis cell (18), and a outlet duct (22), through which the gas can flow from the analysis cell (18); said analysis cell (18) comprising a focusing lens (24), suitable for focusing said laser beam in a focal area (26) inside the analysis cell (18), said focal area (26) acting as a source for radiation Raman collected in a direction perpendicular to the direction of the beam, said analysis cell (18) comprising a window (27) and/or lens suitable to be crossed by said Raman radiation,
 - an imaging group (28) of the Raman source and a spectrograph (30); said imaging group being suitable for forming an image of the Raman source input to said spectrograph (30); and
 - a detector (32) suitable for collecting the image of the spectrum formed by the spectrograph (30),
- and also characterized in that the seal for the gas inside said analysis cell (18) is obtained, in correspondence with the entry of the laser beam into the same analysis cell (18), by means of said focusing lens (24).

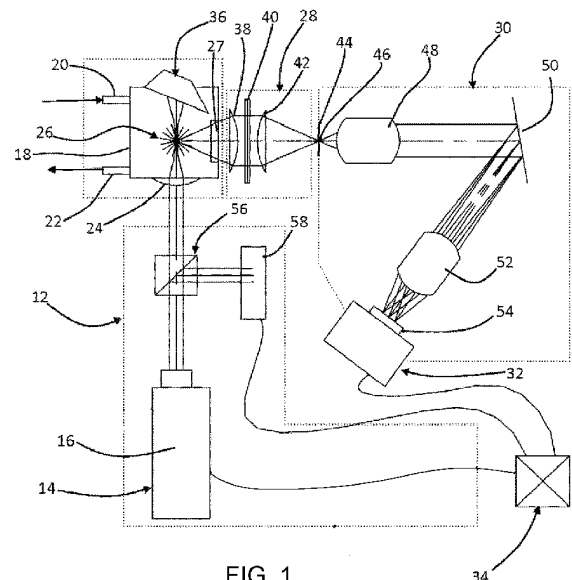


FIG. 1



EUROPEAN SEARCH REPORT

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-The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 2 April 2024	Examiner Mason, William
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CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing claims for which payment was due.

☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due and for those claims for which claims fees have been paid, namely claim(s):

☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

☐ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.

☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.

☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:

☒ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:

1 - 4, 7 - 13

☐ The present supplementary European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims (Rule 164 (1) EPC).

**LACK OF UNITY OF INVENTION
SHEET B**

Application Number

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The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. claims: 1-4, 7-13

An optical device for Raman analysis of the composition of gases comprising a multimode laser source, a spectrograph, imaging means for collecting an image of the spectrum and a programmable control unit for applying a deconvolution algorithm on the spectrum for the improvement of the spectral resolution.

2. claims: 5, 6

An optical device for Raman analysis of the composition of gases comprising a multimode laser source, a spectrograph, imaging means for collecting an image of the spectrum and a laser beam stopper absorbing the laser beam which comprises a tubular section and which also defines the inlet or outlet duct through which a gas can flow in to or out from the inside of the analysis cell.

3. claims: 14, 15

A method for Raman analysis of the composition of gases comprising imaging a spectral band of the gas, straightening the lines in the spectral band by means of an algorithm, integration of the signal of all the pixels in each spectral band between a lower line and an upper line to obtain a data vector representing the true Raman spectrum.

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO.

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02-04-2024

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